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THESIS

ANALYSIS OF SUBSPECIALTY UTILIZATION
OF NAVAL OFFICERS WITH A FOCUS ON
TIME SPENT IN SUBSPECIALTY TOURS

by

Jeffrey W. James

March, 1995

Co-Advisors: Julie A. Dougherty
Richard S. Elster

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This thesis examines the utilization of subspecialty-coded naval officers, with a particular focus on determining the amount of time, or tour length, spent in subspecialty billets for naval officers who possess subspecialty codes received as a result of the Navy's funded graduate education (FGE) program. The results show that the tour length values currently used in the Postgraduate Education Quota Model (PQM) by the Navy are severly inflated, and result in annual FGE quotas being projected 22% below what is necessary to maintain an inventory of subspecialty coded officers capable of fulfilling the Navy's subspecialty billets requirements. Conclusions are that while the tour length values computed in this thesis are accurate, further research is warranted to validate empirically the other input variables used to estimate FGE quotas in order to achieve maximum utility from the PQM.

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ANALYSIS OF SUBSPECIALTY UTILIZATION OF NAVAL OFFICERS WITH A FOCUS ON TIME SPENT IN SUBSPECIALTY TOURS

by

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Submitted in partial fulfillment
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ABSTRACT

This thesis examines the utilization of subspecialty-coded naval officers, with a particular focus on determining the amount of time, or tour length, spent in subspecialty billets for naval officers who possess subspecialty codes received as a result of the Navy's funded graduate education (FGE) program. The results show that the tour length values currently used in the Postgraduate Education Quota Model (PQM) by the Navy are severly inflated, and result in annual FGE quotas being projected 22% below what is necessary to maintain an inventory of subspecialty coded officers capable of fulfilling the Navy's subspecialty billets requirements. Conclusions are that while the tour length values computed in this thesis are accurate, further research is warranted to validate empirically the other input variables used to estimate FGE quotas in order to achieve maximum utility from the PQM.

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I. INTRODUCTION

The Navy's Officer Subspecialty System serves as a means to define the graduate education requirements of the Navy. An integral part of the subspecialty system is the Postgraduate Quota Model (PQM), which is used to determine the number of officers whom the Navy must provide funded graduate education (FGE) to in order to fulfill the subspecialty billet requirements. Robust assumptions are included in the PQM regarding time spent in subspecialty coded billets by officers with applicable subspecialty codes, some of which may not be accurate. Empirical research is therefore warranted to determine the validity of these assumptions.

A. OBJECTIVES AND RESEARCH QUESTIONS

The primary objective of this thesis is to examine the utilization of subspecialty, or p-coded, naval officers who have received funded graduate education. As such, the primary research question to be addressed is:

> How much time do Naval officers who receive funded graduate education spend in subspecialty coded billets as a function of rank?

Subsidiary research questions (which will be based upon the answer to the primary research question) are:

> 1. What are the implications of replacing the *assumed tour length* values currently used in the Postgraduate Quota Model with the tour length values computed in this thesis?
>
> 2. Are there significant differences between the tour lengths of officers as a function of rank and gender?

3. Is the Navy realizing an adequate return on the investment made to provide funded graduate education to it's officers?

B. SCOPE AND LIMITATIONS

This thesis will focus on determining the time spent in subspecialty coded billets for naval officers who possess subspecialty codes received as a result of the Navy's FGE program. The study will be limited to Unrestricted Line Officers (URL), Restricted Line Officers (RL), and Staff Corps Officers in the ranks of LT through CAPT. The 1994 Officer Master File (OMF) is the primary data source for the study. A cross-sectional analysis of the OMF will be undertaken to determine average subspecialty tour length, with emphasis on determining whether differences exist across rank, designator, and gender.

C. ORGANIZATION OF THE THESIS

Chapter II provides a background and literature review of the Navy's FGE program, the subspecialty system, human capital theory, and the Postgraduate Quota Model. Chapter III describes the data and methodology used to determine the *tour length* values to be used in the PQM. Chapter IV presents the results of the data analysis. Chapter V provides the conclusions and recommendations based upon the analysis conducted in this thesis.

II. LITERATURE REVIEW

This chapter will provide a short history of the Navy's FGE program, the subspecialty system, human capital theory, and the Postgraduate Quota Model.

A. BACKGROUND AND HISTORY OF FGE

The Navy's FGE program dates back to 1909, when the Secretary of the Navy (SECNAV) directed that a graduate division of the U.S. Naval Academy be formed to provide advanced education for line officers in the areas of science and technology. This direction came as a result of the problems experienced during the around-the-world cruise of the Great White Fleet. In 1947 Congress legislated that the graduate division of the U.S. Naval Academy be abolished and the Naval Postgraduate School (NPS) be created as a stand-alone institution. NPS was formally moved from the Naval Academy grounds to Monterey, California in 1951, and has hence grown to include 11 departments, three academic groups, and 78 curricula ranging from Electrical Engineering to Financial Management. (Marshall, 1993)

In addition to NPS, the Navy's FGE program also consists of civilian institutions (CIVINS) as well as various scholarship programs, which provide graduate education to naval officers in subjects with no particular military focus, such as chemistry and law. NPS, however, is the primary source of FGE (CNO memo 27 Jul 94). It is the combination of NPS, CIVINS, and the various scholarship programs which make up the Navy's FGE program. (Marshall, 1993)

As stated in the Chief of Naval Operations memo dated 27 Jul 94:

> With today's technological, managerial, political, and economic complexities, the need for graduate level expertise has never been greater. Educating officers in specific subspecialties greatly increases operational readiness and, as a corollary benefit, develops the intellectual diversity and capacity that enhances the

> total professional performance of our officer corps. Our investment in graduate education must be pursued as a priority even in the face of competing demands and declining resources.

Additionally, the CNO reaffirmed that "...the investment in graduate education of selected officers to be a strategic requirement for the Navy." The FGE program exists to ensure the Navy has enough qualified individuals to fulfill the billet requirements of the subspecialty system, which is discussed in the following section. (CNO memo 27 Jul 94)

B. THE SUBSPECIALTY SYSTEM

The purpose of the U.S. Navy's Subspecialty System is twofold. First, the subspecialty system acts to "define the graduate education requirements for the Navy." (Officer Subspecialty System Handbook) Secondly, it is the tool by which naval officers who receive FGE are managed relative to subspecialty billet assignments.

1. Management of the Subspecialty System

The first step in determining the subspecialty needs of the Navy lies with Commands and Sub-Activities, as they originate the Subspecialty Requirements Requests (SRR's) which state the need for subspecialist billets to support their particular mission. The SRR's are forwarded directly to the Major Manpower Claimant (MMC). The MMC is charged with the following:

- Review all SRR's under assigned claimancy.
- Ensure all SRR's meet requirements stipulated in subspecialty billet criteria statements.
- Identify all non-essential subspecialty authorizations.
- Maintain a file of all subspecialty Specific Criteria Statements.

Once the MMC has reviewed and validated the need for the particular

subspecialty billet, the request is forwarded to the Designator Advisors (DA's) and the Primary Consultants (PC's). The DA's review the SRR's from the perspective of ensuring the subspecialty is compatible with the requested designator. Additionally, the DA's, together with the PC's, ensure the SRR represents a justified utilization of the designator in the billet requested. The DA's recommend approval/disapproval of the SRR to Chief of Naval Personnel (CNP) (Pers-213D1). The PC's have several tasks to perform:

- Serve as the primary point of contact for the assigned subspecialty skill field.
- Originate and maintain Specific Criteria Statements (minimum educational/training/experience levels required for optimum performance in a subspecialty billet).
- Review SRR's to ascertain whether requests represent valid utilization of subspecialties.
- Ensure FGE billet authorizations match career paths and maximize potential utilization of subspecialists.
- Recommend, along with DA's, approval/disapproval of SRR's to CNP (Pers-213D1).
- Approve/disapprove curricula submitted by officers for subspecialty masters or higher programs, as well as approve/disapprove "significant experience" requests for subspecialty codes by officers.

Next, the Subspecialty Requirements Coordinator (SRC) acts as the liaison between the DA's and PC's in validating the SRR. The SRC also develops policy for subspecialty management, and ultimately approves/disapproves SRR's. Finally, the SRC convenes the Subspecialty Requirements Review (SRR), a biennial review of graduate education criteria and billet requirements for each subspecialty.

2. Subspecialty-Coded Billets

Subspecialty billets are those which require education or training above and beyond that which would normally be required by an officer's primary specialty. The subspecialty system assigns codes to both subspecialty billets and officers in order to facilitate proper management of both. The codes are made up of four numeric digits followed by an alphabetic character. The subspecialty code can be broken down into three distinct parts: the functional field, the education/skill field, and the education/skill level. The first two numbers describe the functional field, the next two describe the education/skill field, while the last character describes the education/skill level. A generic breakdown of the subspecialty code is shown in Figure 1, while Appendix A offers a more detailed explanation, as well as a list, of all naval officer subspecialty codes. (Officer Subspecialty System Handbook)

3. Subspecialty-Coded Officers

Officers who have successfully completed a FGE program are awarded a subspecialty, or p-code. The subspecialty code held by an officer is structured identically to those assigned to a subspecialty billet. Subspecialty codes are conferred upon Unrestricted Line (URL), Restricted Line (RL), and Staff Corps Officers who meet the subspecialty criteria, either through formal Navy-funded graduate education, partially-funded off-duty education, or experience in Navy-specific functional areas. This thesis, however, will be limited to analyzing only those officers who received their subspecialty codes as a result of the Navy's FGE program. Flag officers and Limited Duty/Warrant officers are not included in the subspecialty coding structure (Officer Subspecialty System Handbook).

4. Subspecialty Utilization

The Navy's FGE program is designed to provide qualified officers to fulfill the requirements of the subspecialty system. Naval officers who attend graduate school full time for 26 weeks or more under any partially or fully-

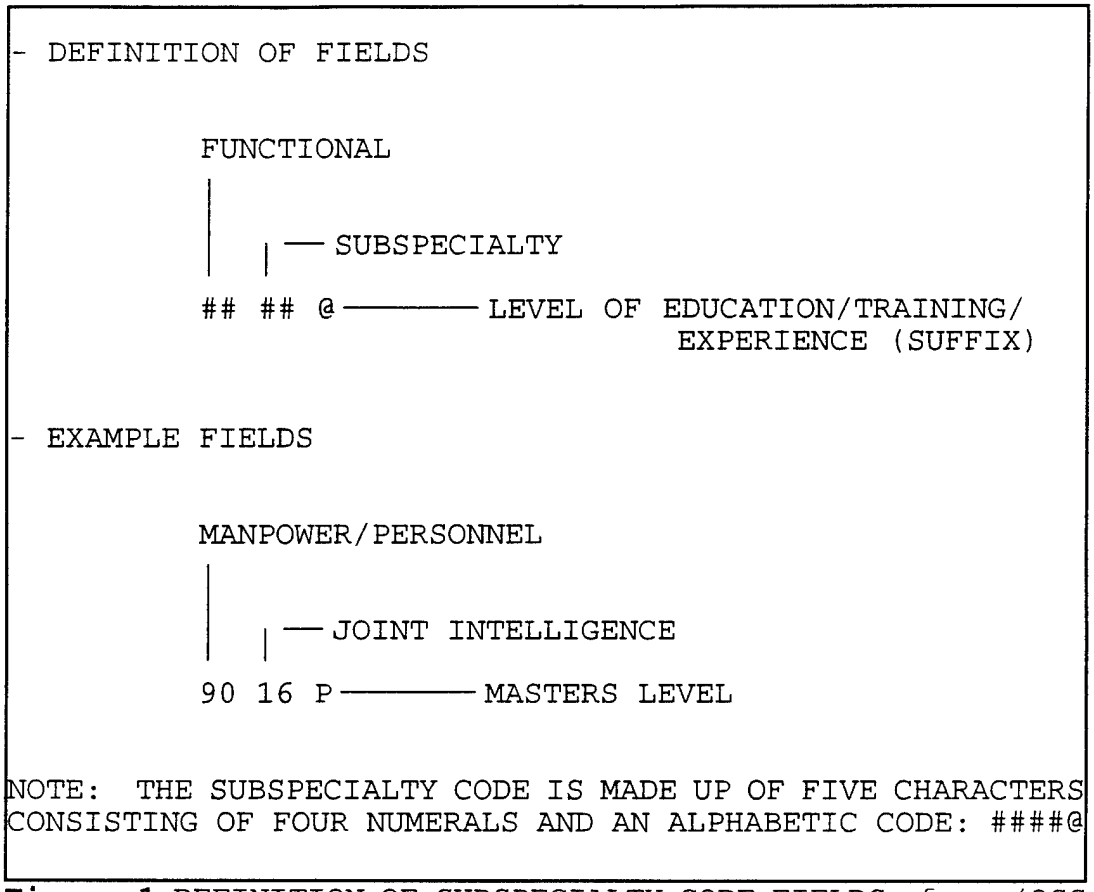

Figure 1 DEFINITION OF SUBSPECIALTY CODE FIELDS from (OSS HANDBOOK, 1993)

funded program are considered "funded". The Navy seeks to maximize the utilization of these officers to the fullest extent possible to ensure the highest return on the investment made in their education. Proper management and utilization of subspecialist officers is a high priority and receives the oversight of the Department of Defense (DoD). (Officer Subspecialty System Handbook)

The DoD monitoring of FGE and subspecialty utilization is delineated in DoD Directive 1322.10, "Policies on Graduate Education For Military Officers." In particular, DoD mandates that the military services

> ...Consider all officers who possess a graduate degree and grade required for assignment to a validated position as available for assignment to that position.

> ...Require that officers who receive a fully or partially funded graduate education serve in a validated position (requiring that education) as soon as practicable after completion of the education, but not later that the second assignment following completion of that education.
>
> ...Ensure that each officer holding a graduate degree serve in as many positions appropriate to that degree as Military Service requirements and career development permit.

Due to the inherent operational demands placed on an officer's career, the Navy interprets the DoD mandate on subspecialty utilization to mean that officers are required to serve in "payback" tours within two ***non-operational*** (shore) tours of completing a FGE program (CNP memo 09 May 94). Clearly, maximum utilization of officers afforded FGE makes sense, but requires close management given the competing demands of career progression, operational requirements, and limited fiscal resources. Consequently, two reports which track the utilization of subspecialty officers are generated to assist personnel planners and PC's. The first report lists all subspecialty coded billets, all subspecialty coded officers, and all subspecialty coded officers who have FGE and are filling a coded billet. The second report, which is provided by CNP (Pers-213), lists all officers in coded billets, regardless of whether they possess subspecialty codes or not as well as provides a summary report of utilization of FGE officers in "payback" tours, as shown in Appendix B. Through the use of these reports, subspecialty utilization can be tracked to determine the yield of the FGE program and the "health" of the subspecialty system. (Officer Subspecialty System Handbook)

C. HUMAN CAPITAL INVESTMENT THEORY

The subject of human capital investment is quite relevant to graduate education in the Navy, as the theory explains that one will "...invest in preparing themselves to be more productive by achieving additional levels of education if

the returns are greater than their other opportunities for investment." (Steiner, 1986) The investment in human capital is not a one-way proposition in the Navy, however. Not only does the individual have to invest time and energy into acquiring the education and forego primary warfare-specialty experience, but the Navy must also deal with the loss of productivity from the individual for the duration of the educational period as well as foot the bill in the case of FGE. Each of the above two situations translates into an opportunity cost for both the individual and the Navy.

1. General Versus Specific Training

The theory of human capital investment asserts that there are two types of training a firm will provide it's employees: general or specific. General training entails skills that can be used by other employers, while specific training is usually only applicable to the job at hand (Ehrenberg and Smith, 1991). An example of general training might be automotive maintenance, while specific training may be as narrow as operating a Navy Tactical Data System (NTDS) console on a guided missile frigate.

The motivation a firm has to provide training is that it serves as an investment in the human capital stock of the employee, and the cost of the training will be offset by way of increased productivity gained as a result of the training. It is clearly in the firm's best interest to provide specific training, as the skills the employee learns apply only to the current firm. Skills learned as a result of general training are readily transferrable to other jobs, and hence impart a certain risk upon the firm of not achieving an acceptable return on the investment should the employee quit and go to work elsewhere. (Ehrenberg and Smith, 1991)

To combat the risks associated with providing general training, most companies pass the cost of the general training on to the employee in the form of lower wages for the duration of the training. This minimizes the loss to the firm should the employee quit and use his skill elsewhere. Specific training

costs are shared by the firm and the employee, with the rationale being the skills are not readily transferrable. However, upon completion of the specific training, the firm will be driven to increase the wage of the employee to minimize the risk of the employee quitting.

2. Human Capital Investment and FGE in the Navy

The Navy's FGE program is a clear example of investment in human capital. The Navy provides graduate education to it's top officers with the tacit agreement that a return on the investment will be achieved. However, the FGE program curricula often contain some elements of general as well as specific training. For example, the electrical engineering curriculum at NPS may focus on Navy related applications, but certainly also teaches fundamentals which can be used outside the Navy. This tends to contradict the previous assertion that an employer will provide general training only if the employee is willing to pay for it. That is not the case for FGE, and therefore several instruments are in place to ensure the Navy receives a return on it's investments. In particular, the Navy requires each officer accepting FGE to incur an obligation equal to 3 years for the first year of graduate school, and 1 year for each subsequent year of school. Additionally, the DoD mandates mentioned in the previous section provide an insurance policy to ensure a return on the investment in FGE is realized. However, the primary method the Navy uses to determine it's return on the investment in FGE is in the utilization of subspecialty officers (Brutzman, 1994).

D. THE POSTGRADUATE QUOTA MODEL

While the Officer Subspecialty System provides the broad guidance for defining graduate education needs for the Navy, the PQM is the *tool* utilized by personnel planners to "...determine and control, by prediction, short and long range graduate education requirements." (Officer Subspecialty System Handbook) The original quota model used to determine FGE quotas was

developed in 1975 by Kneale T. Marshall, a professor of Operations Research at the Naval Postgraduate School. The PQM was upgraded and modified in 1994 by the SAG Corporation, incorporating a more user-friendly Microsoft Excel spreadsheet format which allows personnel planners to easily generate estimates of quota requirements on personal computers. Additionally, the upgraded model also provides the ability to create a multitude of reports regarding FGE quotas broken down by subspecialty code, designator, and rank. The PQM will be more fully discussed in the following section.

1. The PQM: Methodology

a. The Steady State Model

The Steady-State Quota Model is based on current subspecialty billet requirements. It is used to estimate the number of annual FGE quotas required to meet the current P and Q-coded subspecialty billet requirements (The Navy Postgraduate Education Quota Model, Technical Reference and Update Manual, 1994). The model's basic proposition is that subspecialty billets can be filled either by a previously educated officer, or the Navy can send an officer to graduate school, thereby creating a quota. Additionally, the model assumes that an officer will serve in a non-related billet following FGE before serving in a coded billet. One further specification of the model is that lieutenant subspecialty billets are filled by junior lieutenant FGE students, lieutenant commander subspecialty billets are filled by lieutenant FGE students, and so on through the rank of captain.

The model includes four variables which may be massaged by personnel planners to generate "what-if" scenarios. These variables are:

1. First Availability: the percentage of postgraduate students available for P- or Q-code billets at their first opportunity (that is, after an intervening sea tour). This factor depends on school attrition (usually quite low) and continuation rates between graduation and the payback tour. Increasing first availability will decrease the number of quotas. This variable should range between 0 and 1.

2. Utilization Rate: the percentage of available graduates who are assigned to P- or Q-code billets. This policy variable should remain equal to 1 unless some graduates will not (ultimately) be assigned to P- or Q-code billets. Decreasing the utilization rate increases the number of quotas needed. This variable should range between 0 and 1.

3. Later Availability: the percentage of officers serving in P- or Q- code billets who will be available for a subsequent tour. This factor provides the second avenue for filling billets (using previously trained officers). Increasing later availability will decrease the number of quotas needed. This variable should range between 0 and 1.

4. Tour Length: the average number of years served in P- or Q-code billets. Lengthening the average tour reduces the number of quotas needed. For example, a two-year tour length implies that one additional trained officer must be produced every other year for each billet; a four-year average means producing one additional trained every four years.

Each of the above variables can have significant effects on the number of FGE quotas generated each year. Policy decisions can be made to alter each variable to achieve the proper mix of quotas and subspecialty utilization, within the constraints of manpower and fiscal resources. While each of the above variables are relatively self-explanatory, it is worth defining exactly what the Tour Length variable represents. The Tour Length variable represents the mean amount of time a subspecialty coded officer spends in a P or Q coded *billet* at a particular rank (Macklin, 1995). It does not mean the average length of a particular *tour*, as an officer may spend more than one tour in a P or Q coded billet at a particular rank. A look at the Steady State Quota Algorithm is now presented to show the relationships among the variables. (The Navy Postgraduate Education Quota Model, Technical Reference and Update Manual, 1994)

(1) The Steady-State Quota Algorithm.

Steady-state quotas for the PQM are computed as a function of subspecialty code, rank, and designator. The quotas are based on the number of billets required to be filled and the variables discussed in the previous section. The steady-state algorithm is shown in Equation 1.

$$Q_{i,j} = \frac{(B_{i,j}/TL_j) - (FA_{j-1} * LA_{j-1} * Q_{i,j-1})}{FA_j * UR_j} \qquad (1)$$

$Q_{i,j}$ = annual quota for subspecialty *i*, paygrade *j* ($Q_{i,j-1}$)

B_{ij} = number of billets to be filled in subspecialty *i* and paygrade *j*

TL_j = tour length at paygrade *j*

FA_j = first availability at paygrade *j*

LA_j = later availability at paygrade *j*

UR_j = utilization rate at paygrade *j*

Before explaining the equation, it bears repeating that quotas for billets in paygrade *j* (B_{ij}) must be filled by officers in paygrade *j-1.* Now, the first step in the equation is to divide the number of billets in subspecialty *i* paygrade *j* (B_{ij}) by the average tour length in paygrade *j* (TL_j). This gives the number of educated officers required. The next step is to subtract the number of billets that can be filled by previously educated officers, which is paygrade *j-1*'s quota ($Q_{i,j-1}$) multiplied by the product of paygrade *j-1*'s first availability (FA_j) and later availability (LA_j). Lastly, the equation is divided by the product of the first availability (FA_j) and the utilization rate (UR_j). The yield is the annual number of quotas required for subspecialty *i* at paygrade *j* ($Q_{i,j}$). (The Navy Postgraduate Education Quota Model, Technical Reference and Update Manual, 1994)

b. The Quota Planning Model

Whereas the Steady-State Quota Model is solely requirement (billet) driven, the Quota Planning Model compares subspecialty billet requirements with the inventory of previously educated officers as well as officers currently in FGE to determine future quotas. The model first computes an "implied" inventory which indicates how many officers must be in the inventory in order to meet billet requirements (by grade, subspecialty, and community). This implied inventory is estimated from billets and user specified values for promotion, continuation behavior, and rotation rates. The model then computes the predicted inventory by taking the current inventory of subspecialty coded officers and aging this inventory. This aging is accomplished by adding current FGE students into it based on projected rotation dates, and applying a Markov aging process to the inventory to predict how many officers will be in the system in each of the planning years (The Navy Postgraduate Education Quota Model, Technical Reference and Update Manual, 1994). Finally, when the first planning year is being estimated, the predicted inventory is compared with the "implied" required inventory to tender quotas. These computed quotas are then entered into the initial planning inventory and subordinated to the Markov aging process. Each subsequent year in the planning cycle is computed in a like manner.

A number of assumptions and user-specified parameters are incorporated into the planning model which warrant discussion. The first assumption is that all FGE students have a two year academic curriculum. A consequence of this assumption is that the initial planning year is actually two years in the future, which translates to mean quotas established this year will appear in the inventory of educated officers two years in the future.

The parameters which are variable and user defined include promotion flow points, high-year tenure points, promotion rates, and tour lengths. The combination of these variables and billet requirements are what

determine the "implied" inventory for a subspecialty. "Implied" inventory is especially responsive to the promotion flow points and tour length variables. In fact, "...the longer the tour length relative to time in grade, the smaller the implied inventory relative to requirements." (The Navy Postgraduate Education Quota Model, Technical Reference and Update Manual, 1994) While promotion flow points have been subjected to significant study in the past to determine relatively accurate estimates, average tour lengths for subspecialty billets have, to the author's knowledge, been subjected to no empirical research to support the currently used figures. This thesis is undertaken with the intent of substantiating average subspecialty tour lengths.

III. DATA AND METHODOLOGY

This chapter will describe the data and methodologies used to conduct the analysis undertaken in this thesis.

A. DATA SET DESCRIPTION

The 1994 Officer Master File (94 OMF) served as the primary data source for this thesis. A copy of the 94 OMF resides on the NPS mainframe computer, and was accessed and analyzed using Statistical Analysis Software (SAS) version 6.0. The 94 OMF contained 66,124 records for officers in paygrades O-1 through O-10.

The 94 OMF was used as the sole source for data in this thesis for several reasons. First, it was decided that a "snapshot" approach, in which officers are only looked at based on their current rank, was the most appropriate to this thesis due to the significant changes occurring in the Navy as a result of downsizing. While a cohort analysis might provide what may be considered more reliable or in-depth information upon which to base the analysis, the "snapshot" cross-sectional approach utilized in this thesis is actually more revealing of the trends that are currently happening. The following sections in this chapter will discuss the restrictions placed on the data set as well as the statistical testing methods used.

B. OVERVIEW OF RESTRICTIONS PLACED ON DATA SET

The primary focus of this thesis is to determine the average tour length in subspecialty coded billets for naval officers who received FGE. As such, the data set was restricted so that only officers who met the following criteria were retained for analysis:

- Subspecialty coded officers with subspecialty code suffixes of P, Q, M, N, C, or D, which were received as a result of a Navy funded

graduate education program. See Figure 1 and Appendix A for a detailed explanation of subspecialty code suffixes.

- Designators in the URL, RL, and Staff Corps.
- Officers in the ranks of O-3 (LT) through O-6 (CAPT).

1. Subspecialty Code Suffix Restriction

The subspecialty code suffix explains the level of education, training, or experience a subspecialist has acquired. In order to restrict the analysis to those subspecialty officers who received their primary subspecialty codes through a funded, Navy sponsored graduate education program, it was necessary to include only the subspecialty code suffixes P, Q, M, N, C, and D, as these suffixes are only given to officers who have graduate degrees. Table 1 provides a frequency distribution of suffixes for subspecialty coded officers in the adjusted OMF.[1]

The next restriction placed on the data set was to include only those officers described above who have a postgraduate utilization code in their record. The 94 OMF contains a field for this code, which is assigned to all officers who have received a master's degree, post-master's degree, or Ph.D. as the result of a Navy funded education program. The postgraduate utilization code is used to track whether an officer has served in a "payback" tour in accordance with DoD directive 1322.10. For a further discussion of utilization as it relates to DoD directive 1322.10, see Appendix B. The combination of the subspecialty code suffix restriction as well as the postgraduate utilization code restriction ensures that the data set includes only those officers who have a received a graduate degree through a Navy funded education program.

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[1] "Adjusted OMF" is the data set that was used for the analysis once all restrictions were applied to the original 94 OMF.

SUBSPECIALTY CODE SUFFIX	ADJUSTED OMF
P	5675
Q	1137
M	36
N	269
C	15
D	46
TOTAL	**7178**

Table 1. Frequency Distribution of Subspecialty Code Suffixes.

2. Designator Restriction

The Navy's officer corps is composed of three primary designator groups: URL, RL, and Staff Corps officers. The 94 OMF was therefore sorted into the corresponding three designator groups. The career patterns and subspecialty needs of the different designator groups vary significantly, thus making designator differentiation appropriate. As of January 1995, the General URL community (110X) became part of the RL (170X, Fleet Support) community. However, the 110X designator is included in the URL in this thesis as that is how it is recorded in the 94 OMF. The Staff Corps was further restricted to eliminate Medical Corps, Dental Corps, and Nurse Corps officers with medical graduate education subspecialties as they are outside the purview of this thesis. Table 2 provides a frequency and explanation of all designators included in the adjusted OMF, broken down by designator group.[2]

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[2] Warfare specialty is meant to denote a group of like designators. For example, all 111x designators would fall under "Surface Warfare Officers" warfare specialty.

DESIGNATOR	DESIGNATOR GROUP AND DESCRIPTION	ADJUSTED OMF[3]
	UNRESTRICTED LINE OFFICERS	**3412**
110X	General Unrestricted Line (Gen URL) Officers	486
111X	Surface Warfare Officers	1413
112X	Submarine Warfare Officers	329
113X	Special Warfare Officers	39
114X	Special Operations Officers	17
130X	General Aviation Officers	6
131X	Naval Aviators	562
132X	Naval Flight Officers	560
	RESTRICTED LINE OFFICERS	**1771**
144X	Qualified Ship Engineering Duty Officer	864
151X	Aerospace Engineering Duty Officer	256
152X	Aviation Maintenance Duty Officer	86
154X	Aviation Duty Officer	2
161X	Special Duty Officer (Cryptology)	125
163X	Special Duty Officer (Naval Intelligence)	157

[3] The adjusted OMF reflected in Table 2, while less than the adjusted OMF in Table 1, accounts for missing observations in the data set, and is the actual number used in the calculations presented hereafter.

165X	Special Duty Officer (Public Information)	37
180X	Special Duty Officer (Oceanography)	244
	STAFF CORPS OFFICERS	**1985**
230X	Medical Service Corps Officer	86
250x	Judge Advocate General Corps	132
290X	Nurse Corps Officer	37
310X	Supply Corps Officer	894
410X	Chaplain Corps Officer	146
510X	Civil Engineer Corps Officer	690
TOTAL		**7168**

Table 2. Designator Description and Distribution Included in Adjusted OMF.

Consolidation of some designators was performed for ease of understanding and presentation. First, the last digit from all designators, which distinguishes the various branches of the Navy (Active, Reserve, TAR) was removed and replaced with an 'X', as can be seen in Table 3. Additionally, several designators were combined to form one designator. In particular, the 120X designator was combined with the 110X designator, as both are General Unrestricted Line. Similarly, the 121X was combined with the 111X designator, the 122X was combined with the 112X designator, the 123X was combined with the 131X designator, the 124X was combined with the 132X designator, the 126X was combined with the 113X designator, and the 127X was combined with the 114X designator.

3. Rank Restriction

The 94 OMF contains data on all officers currently on active duty and in the reserves. Since the focus of this thesis is on subspecialty coded officers, it is necessary to segregate the data by rank for several reasons. First, the PQM uses the assumption that the most junior officer to receive funded graduate education is a LT, which hence sets the lower bound on rank (The Navy Postgraduate Education Quota Model, Technical Reference and Update Manual, 1994). Additionally, subspecialty codes are only applicable to officers through the rank of CAPT, which sets the upper bound on rank. Table 3 provides a breakdown of the officers included in the adjusted OMF by rank.

RANK	ADJUSTED OMF
O-3 (LT)	1322
O-4 (LCDR)	2519
O-5 (CDR)	2155
O-6 (CAPT)	1172
TOTAL	**7168**

Table 3. Distribution of Officers Included in Adjusted OMF by Rank.

4. Subspecialty Utilization Code Restriction

In addition to the restrictions discussed above, several other techniques were applied to the 94 OMF to prepare for the data analysis. The 94 OMF contains fields for up to ten subspecialty codes for each officer. However, only the most recently attained subspecialty code is considered the primary code. The analysis was therefore limited to the primary subspecialty code for each

officer in the data set. Additionally, there is a field denoting subspecialty utilization, which corresponds to each of the officer's past duty stations. Table 4 describes each of the subspecialty utilization codes. It was decided to include only officers with 'D' or 'E' subspecialty utilization codes, as they most accurately reflect utilization in accordance with DoD directive 1322.10.

C. CODING METHODOLOGY FOR 94 OMF

The adjusted OMF described above was further restricted to include only officers who met the criteria of being LT's through CAPT's with appropriate subspecialty codes received through Navy funded graduate education programs. The approach taken to determine the mean subspecialty tour length, i.e., the time spent in subspecialty coded billets at a particular rank, for the eligible officers was accomplished in the following manner.

If an officer's past duty station had a subspecialty utilization code of 'D' or 'E', indicating an exact or closely related subspecialty billet match, then the arrival date at that duty station was subtracted from the departure date and a tour length value was determined. For ease of illustration, this thesis will use a notional LCDR as an example, but the same methodologies and techniques were applied to the other ranks as well. If the notional LCDR had a subspecialty utilization code of 'D' at his last duty station, and he arrived there in December 1991 and departed in November 1993, and his date of rank as a LCDR was prior to his arrival at that duty station, then his tour length at that duty station, which is assigned the variable name O4PYBK1, would be equal to 1.92 as computed by the following algorithm:

$$O4PYBK1 = (PDS1DYR - PDS1AYR) + (PDS1DMO/12 - PDS1AMO/12) \quad (2)$$

where: PDS1DYR = PAST DUTY STATION 1 DEPARTURE YEAR.

PDS1AYR = PAST DUTY STATION 1 ARRIVAL YEAR.

PDS1DMO/12 = PAST DUTY STATION 1 DEPARTURE MONTH DIVIDED BY 12.[4]

PDS1AMO/12 = PAST DUTY STATION 1 ARRIVAL MONTH DIVIDED BY 12.

The remainder of the notional LCDR's past duty stations as an O-4 are checked to see if any of the other previous duty stations were considered subspecialty payback tours ('D' or 'E' subspecialty utilization codes). If so, the algorithm in Equation 2 was applied to obtain the tour length value for each additional eligible duty station, and the algorithm in Equation 3 was applied to obtain a value for total subspecialty tour length for the notional LCDR.

$$\sum_{i=1}^{n} O4PYBKi \qquad (3)$$

where: n = the number of LCDR subspecialty payback tours for an officer.

A counter, given the variable name O4PYBKN for LCDR's, was then set up to record the number of LCDR's who did subspecialty "payback" tours. It is important to note that it is the number of officers who have done subspecialty payback tours that is being counted, and not the number of subspecialty payback tours done by the officers. After all LCDR records were checked and values computed in Equation 3, it was then possible to determine the mean subspecialty tour length, O4AVTOUR, for LCDR's. This was accomplished by summing the values obtained in Equation 2 for all LCDR's who had done

[4] The departure and arrival months were divided by twelve in order to ensure all figures were in base ten.

CODE	DEFINITION
A	Operational tour required to maintain progression in warfare specialty or leadership tour essential to GURL career progression/specialist track.
B	Educational Assignment (Service College, PG,..).
C	Separation.
D	Officer's grad-ed field matches billet.
E	Officer's grad-ed field closely related to billet.
G	Assignment utilizing officer's subspecialty in subspecialty billet not requiring education.
H	Assignment utilizing officer's subspecialty in an uncoded billet.
J	Officer has more than one subspecialty code and a higher priority exists for utilization of SUB2 or SUB3.
K	Billet is not a subspecialty coded billet but is considered a higher priority requirement.
L	Nonutilization.
M	Officer without graduate education will be utilizing subspecialty.
N	Officer not subspecialty coded.
X	No coded billet exists.
Z	Administrative requirements.

Table 4. Subspecialty Utilization Codes. From Data Element Dictionary for the Officer Personnel Information System Including Midshipmen and Officer Candidates.

subspecialty tours and dividing by the sum of the values obtained in Equation 3 for all LCDR's, as shown in Equation 4.

$$O4AVTOUR = \frac{\sum_{j=1}^{m} \left(\sum_{i=1}^{n} O4PYBK_i \right)}{O4PYBKN} \qquad (4)$$

where: m = the number of officers who have served in O-4 subspecialty payback tours.

Several difficulties were encountered while attempting to arrive at a figure for O4AVTOUR. First, the fields in the OMF for arrival month and departure month from past duty stations were missing in a significant number of observations. These fields are made up of two numeric digits corresponding to the calendar month. It was therefore assumed that arrival and departure months from duty stations follow a uniform distribution, and hence an equal number of arrivals/departures occur in June as in October or March. Therefore, the coding was structured such that any missing information for arrival or departure months would be set equal to a value of six, which is the mean value for the month field in a uniform distribution.

As was mentioned previously, if a LCDR's date of rank was prior to his arrival at an eligible duty station, then the time spent at that duty station was credited as a LCDR "payback" tour, based on the assumption that the officer was ordered into an O-4 billet as an O-4. While this assumption may tend to overstate the true value of the O4PYBK variable, as it counts the entire tour as a LCDR tour even if the officer was promoted to CDR while serving in that billet, it was applied consistently to all officers across the board to prevent

"double-counting" the time in two ranks. The bias introduced by this assumption is noted by the author, and is discussed in the final chapter.

IV. RESULTS OF DATA ANALYSIS

As was previously stated, the PQM makes some rather robust assumptions regarding the amount of time subspecialty coded officers spend in subspecialty coded billets at each rank. The main thrust of this research is to determine the true values for the tour length variable used in the PQM. The following sections will show the tour length variable values computed in this thesis, analyze them in comparison with the assumed tour length values, and discuss the implications of using them as an input variable to determine FGE quotas using the PQM.

A. MEAN VALUES FOR TOUR LENGTH VARIABLE

The primary research question addressed in this thesis is:

> How much time do Naval officers who receive funded graduate education spend in subspecialty coded billets at each rank?

In order to put in perspective the results of the analysis, it is necessary first to review the assumed tour length values currently used in the PQM. To reiterate, the tour length variable represents the mean amount of time subspecialty coded officers spend in subspecialty coded billets at each rank. Table 5 shows the assumed values currently used in the PQM.

The assumed tour length values in Table 5 are provided to familiarize the reader with what is currently used, and to provide a vehicle for comparison to the results obtained in this thesis. Table 6 presents the tour length values computed in this thesis.

One can clearly see that, with the exception of URL LT's and LCDR's, the assumed tour length values currently used in the PQM appear somewhat overstated. Table 7 summarizes the differences between the assumed tour length values and the computed tour length values by showing how much greater the assumed values are relative to the computed values.

DESIGNATOR GROUPS	DEFAULT TOUR LENGTH VALUES USED BY PQM, BY RANK			
	LT	LCDR	CDR	CAPT
URL	2.0	2.0	3.8	5.0
RL	5.0	5.0	5.5	7.5
STAFF CORPS	4.8	5.0	5.5	7.0

Table 5. Assumed Tour Length Values Currently Used In PQM.

DESIGNATOR GROUPS	MEAN SUBSPECIALTY TOUR LENGTH BY RANK			
	LT	LCDR	CDR	CAPT
URL	2.3	2.8	3.0	2.5
RL	3.1	3.5	3.3	3.5
STAFF CORPS	3.0	3.3	3.1	3.1

Table 6. Mean Subspecialty Tour Length By Rank.

DESIGNATOR GROUPS	% DIFFERENCE BETWEEN ASSUMED AND COMPUTED TOUR LENGTH VALUES				
	LT	LCDR	CDR	CAPT	MEAN DESIGNATOR DIFFERENCE
URL	- 15%	- 40%	21%	50%	4%
RL	38%	30%	40%	53%	41%
STAFF CORPS	38%	34%	44%	56%	44%
MEAN RANK DIFFERENCE	20%	8%	35%	53%	

Table 7. Percentage Differences Between Assumed and Computed Tour Length Values Across Designators and Ranks.

Items of particular note in Table 8 are the values for the URL LT's and LCDR's. It appears that these officers spend 15% and 40% more time, respectively, in subspecialty coded billets than was assumed in the PQM. This is not altogether surprising, though. According to the URL career matrices (Appendix D), only the General URL officer has as part of the career track a subspecialty payback tour as a LT, and that tour length can be anywhere from two to three years. Likewise, the URL career matrices indicate that most initial subspecialty payback tours be served as LCDR's, and those tour lengths can be anywhere from two years for Submarine officers to three years for the General URL officer. Therefore, the assumed tour length values of two years for URL LT's and LCDR's are necessarily too small.

With the assumed values for tour length so glaringly different than the

computed values, the next logical step is to determine how these differences affect the steady-state quotas generated by the PQM.

B. STEADY-STATE QUOTAS WITH THE COMPUTED TOUR LENGTH VALUES

The steady-state quotas which are forecast using the PQM incorporate several user-defined variables: first availability, utilization rate, later availability, and tour length. Since tour length was the variable of interest, all others were held constant and the model was run with both the assumed values and the computed values for tour length. Table 8 summarizes the quotas yielded from the PQM using both the assumed tour length and the computed tour length.

The PQM utilizing the tour length values computed in this thesis requires a total annual quota of 873 officers across all designator groups and ranks, as opposed to an annual quota of 714 officers in the PQM utilizing the assumed tour length values. The net difference of 159 annual quotas represents a 22% increase over current quotas. The following sections will provide a detailed analysis of the quotas generated as a result of using the computed tour length values in the PQM.

1. URL Quotas

As one can see from Table 8, the PQM run with the assumed tour length values indicates that 405 URL officers must flow into FGE annually to meet future subspecialty billet requirements, whereas the PQM run with the computed tour length values require an annual flow of only 387 URL officers. This is a net difference of 18 URL officers annually. The computed tour length model requires fewer junior LT and LT quotas than the assumed tour length model primarily due to the under-estimation of the tour lengths in the assumed model, as shown in Table 7. Recall from the discussion of the PQM in Chapter II that quotas for billets in paygrade j (B_{ij}) must be filled by officers in paygrade j-1. This adds validity to the tour length values determined in this thesis as one

QUOTA MODEL USING ASSUMED TOUR LENGTH VALUES

VARIABLE FACTORS	URL				RL				STAFF CORPS				
	LT	LCDR	CDR	CAPT	LT	LCDR	CDR	CAPT	LT	LCDR	CDR	CAPT	
1ST AVAILABILITY	0.95	0.95	0.95	0.95	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	
UTILIZATION RATE	0.75	0.78	0.81	0.81	0.85	0.94	0.97	0.97	0.9	0.96	0.99	0.99	
LATER AVAILABILITY	0.5	0.51	0.55		0.75	0.85	0.9		0.8	0.85	0.9		
ASSUMED TOUR LENGTH	2	2	3.8	5	5	5	5.5	7.5	4.8	5	5.5	7	
QUOTA SUMMARY	URL				RL				STAFF CORPS				TOTALS
	Jr. LT	LT	LCDR	CDR	Jr. LT	LT	LCDR	CDR	Jr. LT	LT	LCDR	CDR	
ANNUAL QUOTAS	83	296	23	3	44	88	17	0	55	77	28	1	714

QUOTA MODEL USING COMPUTED TOUR LENGTH VALUES

VARIABLE FACTORS	URL				RL				STAFF CORPS				
	LT	LCDR	CDR	CAPT	LT	LCDR	CDR	CAPT	LT	LCDR	CDR	CAPT	
1ST AVAILABILITY	0.95	0.95	0.95	0.95	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	
UTILIZATION RATE	0.75	0.78	0.81	0.81	0.85	0.94	0.97	0.97	0.9	0.96	0.99	0.99	
LATER AVAILABILITY	0.5	0.51	0.55		0.75	0.85	0.9		0.8	0.85	0.9		
COMPUTED TOUR LENGTH	2.3	2.8	3	2.5	3.1	3.5	3.3	3.5	3	3.3	3.1	3.1	
QUOTA SUMMARY	URL				RL				STAFF CORPS				TOTALS
	Jr. LT	LT	LCDR	CDR	Jr. LT	LT	LCDR	CDR	Jr. LT	LT	LCDR	CDR	
ANNUAL QUOTAS	72	204	79	31	72	119	33	0	88	113	59	2	873

Table 8. Quota Model Summary.

would expect, a priori, a lower quota requirement for junior LT's and LT's who fill the LT and LCDR billets, given that the computed tour lengths are greater than the assumed tour lengths, all else equal.

However, the FGE quotas for LCDR's and CDR's increase significantly in the PQM when using the computed tour length values versus the assumed values. This quota increase of 350% for LCDR's and 1000% for CDR's in the PQM using the computed tour length values is attributable to the understated (21% for CDR's and 50% for CAPT's) assumed tour length values, as shown in Table 7.

While the URL quotas generated by the PQM using the computed tour length values only exceed those URL quotas generated with the assumed tour lengths by 18, it is important to note the *distribution of officers by rank* as opposed to the gross number of officers. The computed tour length model requires that 79 LCDR's and 31 CDR's be sent to FGE annually. However, a review of the URL career matrices in Appendix D show that attending a FGE program is not normally an option for LCDR's, with the exception of a limited number of SWO's, SEAL's, and Special Operations officers. Additionally, there are no URL designators that have assignment to FGE in the rank of CDR as part of the normal career track. This is further evidenced by the fact that 85% of the URL Navy officers enrolled at NPS are LT's or below, while the PQM indicates that only 72% of the URL officers sent to NPS each year should be LT or below. While the topic of career track policy is not within the purview of this thesis, the relationship it has with FGE and subspecialty tour length is interesting, and will be discussed in the following chapter.

2. RL and Staff Corps Quotas

As can be seen in Table 7, The RL and Staff Corps differ from the URL in that the assumed tour lengths are *all* over-estimated as compared with the computed tour lengths. In fact, the assumed RL and Staff Corps tour lengths are 41% and 44% greater, respectively, than the computed tour lengths. The

impact the computed tour lengths have on annual quotas is to increase them by 77 for the RL and 106 for the Staff Corps. These figures represent a combined increase of 50% over the quotas required by the PQM when the assumed tour length values are used.

Again, Table 7 shows that the assumed tour length values are consistently over-estimated for the RL and Staff Corps. This differs from the URL values in that the distribution of quotas across ranks for the RL and Staff Corps remains constant when the PQM is run using the computed tour length values. Since career matrices for RL and Staff Corps officers are not available, it is assumed that despite the increased number of quotas required by the PQM, the consistent rank distribution does not suggest that an anomalous career track be undertaken to facilitate meeting the increased quotas requirements.

C. DIFFERENCES IN TOUR LENGTH VALUES BY RANK AND GENDER

A subsidiary research topic addressed in this thesis is whether there are significant differences in tour lengths based on rank and gender. A look at Table 9 reveals that there are in fact differences in tour lengths when rank and gender restrictions are in place. This is not altogether surprising, though, as career paths become more varied with seniority, and gender is still an obstacle to numerous billets for women, especially in the URL.[5]

1. Rank Differences in the URL, RL, and Staff Corps

With respect to differences in tour lengths for URL officers as a function of rank, LT's consistently have shorter tour lengths than all other ranks as shown in Table 8. This is to be expected, though, as most officer's are mid-grade LT's when they begin a FGE program, and are senior LT's or junior

[5] While the number of billets available to women continues to grow, there is still an overwhelming proportion in the URL that are male-only, such as those in special warfare, submarines, and numerous destroyer class warships.

LCDR's before they are eligible for a "payback" tour, given the operational tours required of the URL officer. Looking to the other ranks, there are no real eye-opening discoveries regarding tour lengths. The values for LCDR's, CDR', and CAPT's all fall within the windows as described in the career matrices in Appendix D.

Using rank as the measuring stick, there are again no major discoveries. The lower tour lengths belong to the LT's for much the same reason as was presented in the discussion on URL officers. The one result of note is the tour length for RL CAPT's. The three and a half year tour length for the RL CAPT is 40% greater than the URL CAPT and 13% greater than the Staff Corps CAPT. This is again closely related to the subspecialty utilization rate for RL officers, which in 1992 was 97%, as compared with a utilization rate of 80 % for the URL and 90% for the Navy as a whole (CNP memo 23 Jun 93).

2. Gender Differences in the URL, RL, and Staff Corps

In view of the restricted domain of jobs available to female URL officers, it logically follows that their subspecialty tour lengths be greater than their male counterparts due to the relative greater number of operational demands required of the male URL officers. This assertion is supported by the results shown in Table 9. Female URL officers in the ranks of LT through CDR spend an average of 16% more time in subspecialty tours than male URL officers. Furthermore, the General URL community, which is composed primarily of females, had a 90% subspecialty utilization rate in 1992, as compared to an average of 72% for the submarine, surface, and aviation communities (CNP memo 21 Jun 93). This higher utilization rate directly translates into more time spent in subspecialty billets, which in turn means longer tour lengths.

When compared with the URL, the differences in tour lengths for RL and Staff Corps officers with respect to gender are essentially uninteresting and trivial. The average difference between female and male RL and Staff Corps

LT's through CDR's results in a 4% lower tour length for females. This low value is considered insignificant and warrants no further discussion.

	COMPUTED TOUR LENGTHS BY RANK AND GENDER											
	URL				RL				STAFF CORPS			
	FEMALE	n	MALE	n	FEMALE	n	MALE	n	FEMALE	n	MALE	n
LT	2.9	17	2.2	86	3.1	12	3.1	154	3.1	24	2.9	119
LCDR	3	66	2.8	210	3.3	30	3.5	310	2.9	27	3.3	308
CDR	3.2	29	2.9	168	3.2	9	3.3	283	2.8	17	3.1	307
CAPT	1.9	1	2.5	116	4.5	1	3.5	113	2.6	1	3.2	162
TOTALS		113		580		52		860		69		896

Table 9. Tour Lengths by Rank and Gender

V. CONCLUSIONS AND RECOMMENDATIONS

A. SUMMARY

The purpose of this thesis was to determine the true tour length values for Naval officers who possess subspecialty codes received through a Navy-sponsored FGE program. The 94 OMF was used as the data source for computing the tour lengths as it provided an up-to-date "snapshot" of the current inventory of subspecialty officer career trends. The extremely dynamic environment brought about by the drawdown has affected all aspects of career track management and assignment across officer communities, and for this reason the analysis was restricted to include only billets held by officers in their current rank; to do otherwise could introduce bias into the tour length estimates by dampening the effects of what is happening now with what happened in the pre-drawdown Navy.

B. CONCLUSIONS

The results presented in this thesis clearly warrant attention. The computed tour length values differ significantly from the assumed tour length values currently being utilized as input parameters in the PQM. It would be naive to conclude that simply replacing the assumed values with the computed values would improve the accuracy of the PQM sufficiently to warrant no additional study. The results obtained in this thesis bring to the surface a host of other issues which must be dealt with if the Navy is interested in maximizing the utility of the subspecialty system in general, and the PQM in particular. One can conclude that the tour length values computed in this thesis reflect reality, and eventually, must replace the assumed values currently in place.

The computed tour length values suggest that the number of annual FGE quotas required to meet the subspecialty needs of the Navy be increased by 22%, from the current 714 officers to 873 officers. While this may at first look

appear to be achievable, given the relatively small incremental changes required by each officer community, the *distribution of officers* required raises a flag. The PQM, when run with the computed tour length values, calls for 31 URL CDR quotas annually. This is obviously not realistic, as most URL CDR's do not have the latitude in their career track for a two year stint at graduate school.

One may question the worth of the tour length values computed in this thesis given the assertion of the previous paragraph. The tour length values computed in this thesis are, however, accurate, and reflect, as recently as 1994, the assignment trends of subspecialty-coded officers. However, just as a chain is only as strong as its weakest link, so to is the predictive ability of the PQM. The tour length variable is but one link in the PQM chain. Tour lengths have been empirically validated in this thesis and can be used in good conscience. There are, however, several other variable links in the PQM chain which must be validated before the predictive value of the PQM can be maximized. These include the variables first availability, utilization rate, and later availability. A further discussion of what must be done with these variables is presented in the following section.

C. RECOMMENDATIONS

Despite the fact that this thesis was successful in that empirical tour length values were computed, the problem of determining accurate FGE quotas still exists. Again, tour length is but one of four user-defined variables utilized by the PQM to determine FGE quotas. The other three variables must be accurate as well for the PQM to be of value. Several recommendations are therefore offered to improve the quality of the PQM.

1. Validate Remaining PQM Variables

The first step in improving the predictive abilities of the PQM is to validate the first availability, later availability, and utilization rate variables. The values currently used for first availability (.95 for URL, .99 for RL and Staff Corps) appear to be inflated, as the current obligated service associated with FGE generally only obligates the officer to one tour following the FGE program completion. This obligation is not far-reaching enough to ensure an officer does a payback tour, given that they are not required immediately. The current first availability value also fails to account for officers who leave the service at the expiration of their obligated service, which is not a trivial number in the drawdown era. Once the first availability rates are determined, the later availability must be computed. When first availability is looked at in combination with career planning matrices, a more realistic later availability value can be found. Additionally, utilization rates must be reviewed. Again, a look at career planning matrices shows that the opportunities to serve in payback tours is difficult at best, and in a downsizing era in which operational billet have first priority and officer attrition is high, utilization of subspecialty officers may suffer.

2. Restrict The PQM

It is further recommended that research be conducted regarding rank restrictions on the PQM. In particular, the PQM should be restricted such that no CDR quotas are generated and only a limited number of LCDR quotas are allowed, in accordance with guidelines promulgated in the career planning matrices. Since these restrictions reflect what happens in reality, their impact is of interest and may prove useful.

3. Determine The Return On Investment

The investment in human capital made through the FGE program is enormous. This thesis did not determine the return on investment made in officers who received FGE because the work was restricted to determining tour

lengths. It is recommended that further research regarding the return on investment be conducted. Particular attention should be paid to relationships between the obligated service requirements of FGE and the continuation, first availability, and utilization rates of subspecialty officers.

APPENDIX A. SUBSPECIALTY CODE BREAKDOWN

SUBSPECIALTY CODE FUNCTIONAL FIELDS

(1ST AND 2ND CHARACTERS)

Background Experience

Functions Fields are only assigned by board action.

10XX NO LONGER ASSIGNED

30XX INTELLIGENCE

40XX OPERATIONS SYSTEMS TECHNOLOGY

50XX COMMAND & CONTROL

60XX PLANS & PROGRAMS

70XX POL-MIL/STRAT PLAN

80XX MATERIAL SUPPORT

83XX RDT&E

90XX MANAGEMENT AND HUMANITIES

00XX Officer: If functional fields do not apply 00 is assigned.

Billet: Should be assigned unless staff corps subspecialty.

EDUCATION/TRAINING/EXPERIENCE FIELDS
(3RD AND 4TH FIELDS)

XX10-PUBLIC AFFAIRS
XX11-ENGLISH
XX12-HISTORY
XX16-JOINT INTELLIGENCE
XX17-NAVAL TECH INTEL
XX18-REGIONAL INTEL
XX19-OPERATIONAL INTEL
XX20-GEN POLITICAL SCI
XX21-MIDEAST/AFRICA/S.ASIA
XX22-FAR EAST/PACIFIC
XX23-WESTERN HEMISPHERE
XX24-EUROPE
XX25-INT'L NEGOTIATIONS[D]
XX26-STRATEGIC PLAN (GEN) [D]
XX27-STRATEGIC PLAN (NUC)[D]
XX28-STRATEGIC PLAN
XX29-SPEC OPS/LOW INT CONF
XX30-MANAGEMENT (GEN) [A]
XX31-FINANCIAL MANAGEMENT
XX32-MATL LOGISTICS SUPT MGT
XX33-MNPWR, PERS, TRNG ANAL
XX35-TRANSPORTATION MGT
XX37-EDUCATION & TRNG MGT
XX40-APPLIED LOGIC (GEN)[D]
XX41-APPLIED MATH
XX42-OPERATIONS ANALYSIS
XX43-OPERATIONAL LOGISTICS
XX44-ANTISUBMARINE WARFARE
XX45-COMMAND & CONTROL [C]
XX46-ELECTRONIC WARFARE
XX47-GEOPHYSICS
XX48-METEROLOGY [B]
XX49-OP OCEANOGRAPHY
XX50-NAVAL SYS ENG (GEN) [A]
XX51-NAVAL CONSTRUCTION & ENG
XX52-NUCLEAR ENGINEERING
XX53-NUC PROP PLANT OPS
XX54-NAVAL/MECHANICAL ENG
XX55-ELECTRONIC ENG
XX56-UNDERWATER ACOUSTICS [D]
XX60-WEAPONS ENG (GEN)[A]
XX61-WEAPONS SYS ENG [D]
XX62-CHEMISTRY
XX63-WEP SYS SCI (PHYSICS) [D]
XX66-COMBAT SYS SCI & TECH
XX67-NUC PHYS (WEPS & EFFECTS)
XX68-STRAT WEPS (FBM)
XX69-STRAT NAV (FBM)
XX70-AERO SYS END (GEN) [A]
XX71-AERO ENG
XX72-AVIONICS
XX73-FLIGHT PERF/TEST PILOT
XX75-SPACE SYS (GEN) [A]
XX76-SPACE SYS OPERATIONS
XX77-SPACE SYS ENG
XX80-COMMUNICATIONS (GEN) [D]
XX81-COMMUNICATIONS ENG
XX82-COMM SYS TECH [D]
XX89-INFORMATION MGT
XX90-COMPUTER TECH (GEN) [D]
XX91-COMPUTER TECH-SCI
XX95-COMPUTER TECH-SYS MGT[D]
0000-ANY DISCPLINE

NOTE: Staff corps can utilize some of the non-staff corps subspecialty codes.

[A] - BILLET CODES ONLY
[B] - ASSIGNED TO 1800 DESIGANTOR
[C] - TWO TOURS REQUIRED FOR EXPERIENCE CODE
[D] - BEING DELETED
[E] - NEW CODES

1. GRADUATE EDUCATION NON PROVEN SUFFIX

P, D, N CODES: Require theoretical knowledge that could not be acquired, under normal circumstances, as a result of progressive or selected assignments, attending short courses, or on-the job training. This knowledge would be obtained in a formal education regimen leading to a degree; must meet educational skill requirements (ESRs).

2. GRADUATE EDUCATION PROVEN SUFFIX

C, M, Q, F, CODES: Apply only to URL officer billets in the grades of LCDR through CAPT. The billet must first satisfy the proper criteria for the subspecialty education, training and experience at the base (non-proven subspecialists) level. Proven subspecialty billets should not exceed 30% of the total subspecialty authorization within any one subspecialty field. This will be controlled by CNO (DCNO (Manpower, Personnel and Training)). In general, these billets require the more experienced senior (proven) officer of the subspecialty system. The billets should be thought of as follow-on billets for basic subspecialty system billets.

3. DOCTORATE - C, D SUFFIX

Required D - Requires comprehensive knowledge of specific theories, principles, processes and/or techniques certified through the acquisition of the doctorate for optimum performance of duty; also requires the conception,implementation, appraisal or management of exceptionally complex Navy and/or DOD programs.

Optional D - Requires the officer to routinely interface with personnel who possess decorate level education, or requires the officer to exercise technical, educational or managerial supervision over personnel who possess doctorate level education.

Required and Optional C - All of the D-code criteria are applicable; additionally the billet requires a proven subspecialist at the doctorate level.

4. POST MASTERS - M, N, SUFFIX (post-master's, divided into Engineer and Other)

a. Engineer's Degree Level Criteria

Required N Code - Requires both engineering experience and comprehensive knowledge of scientific theories and engineering principles, processes and/or the techniques certified through the acquisition of the engineer's degree for optimum performance of duty; also requires the conception, appraisal, or management of exceptionally complex Navy and/or DOD programs. The billet requires the application of the most modern techniques in certain scientific fields, such as hydrodynamics, aerodynamics, fluid mechanics, thermodynamics, structural mechanics, nuclear physics, or electronics.

Optional N Code - Requires the application of engineering principles in design and integration of large and complex systems and components on a daily basis, or requires the officer to routinely interface with personnel engaged in rigorous application of the latest engineering knowledge. Also requires the officer to routinely interface with personnel who possess engineer's degrees, or to exercise technical, educational, or managerial supervision over personnel who possess engineer's degrees.

Required and Optional M Code - All of the N-code criteria are applicable; additionally the billet requires a proven subspecialist at the engineer's degree level.

b. Other post-master's Degree Level Criteria

Required N Code - Requires significant educational experience and comprehensive knowledge of current theories and established principles, processes, and/or techniques certified through the acquisition of the post-mater's degree for optimum performance of duty; also requires the conception, appraisal, or management of exceptionally complex Navy and/or DOD programs. These programs usually involve plans, policy, and/or decisions at the highest levels of military and/or government services. Additionally, the billet requires the application of the most modern techniques in certain fields, such as intelligence management, political-military science, strategic planning, applied logic, operations analysis, logistical analysis, operations systems, communications, computer technology, environmental science, or law.

Optional N Code - Requires the application of intricate principles in plans, policy or decision-making within large and complex DOD/Navy organizations on a daily basis, or requires the officer to routinely interface with personnel engaged in rigorous application of the latest educational knowledge within the subspecialty field. The officer must also routinely interface with personnel who possess post-master's degrees, or must exercise fiscal educational or managerial supervision over personnel involved in management or development of plans, policy, and/or decisions made at the highest levels of military and/or government service. The officer must also exercise fiscal, educational, or managerial supervision over personnel who possess post-master's degrees.

Required and Optional M Code - All of the N-code criteria are applicable; additionally the billet requires a proven subspecialist at the post-master's degree level.

5. MASTERS - P, Q SUFFIX

Required P Code - Requires the combination of both professional experience and extensive knowledge of theories, principles, processes and/or techniques certified through the acquisition of the master's degree for optimum performance of duty; also requires the conception, implementation, appraisal or management of complex Navy and/or DOD programs.

Optional P Code - Requires the officer to routinely interface with personnel who possess master's degrees, or requires the officer to exercise technical, educational or managerial supervision over personnel who possess master's degrees.

Required and Optional Q Code - All of the P-code criteria are applicable; additionally the billet requires a proven subspecialist at the master's degree level.

6. MASTER'S NOT FULLY MEETING NAVY REQUIREMENTS - F and G codes

F and G codes are used to denote officers who possess and billets which require master's degrees not fully meeting the specific master's degree criteria in a subspecialty. F and G codes also denote officers who possess, and billets which require, graduate level education and/or advanced training at less than the master's degree level (i.e., submarine school, test pilot school, strategic weapons, and advanced navigation training.

Required G Code - Requires the combination of both professional experience and knowledge of theories, principles, processes and/or techniques certified through graduate education or advanced training for optimum performance of duty; also requires the successful completion of an advanced

training program and/or graduate education courses in the subspecialty field (the graduate education is normally less than one year long); also requires either the application of tested principles to problem areas or the appraisal of work performed by others in Navy and/or DOD programs.

Optional G Code - Requires the officer to routinely interface or supervise personnel who have extensive experience, advanced training or graduate education in the subspecialty field or requires the officer to fully understand and supervise the operation and capabilities of unique, complex, and highly advanced equipment and/or systems.

Required and Optional F Code - All of the G-code criteria are applicable; additionally the billet requires a proven subspecialist at the G-coded level.

APPENDIX B. SUBSPECIALTY UTILIZATION CODES

UTILIZATION	IN WINDOW	OUTSIDE WINDOW
NOT USED	X	A
ONE TOUR	Z	B
MULTI TOUR	Y	C

From Brutzman, 1994.

The Subspecialty Utilization Code matrix is used to track Navy compliance with DoD directive 1322.10. The matrix can be explained by the following:

- **DoD WINDOW** for compliance calls for assignment to an appropriately coded subspecialty billet within two tours following graduation.
- **OUT NOT USED** is an officer who is outside the DoD window (at least two shore tours since graduation) and has yet to complete a payback tour.
- **MUST USE NEXT** is an officer who is inside the DoD window and the first assignment ashore was not a payback tour. If assigned to a payback tour after the present assignment, the officer will be in compliance with DoD guidance.
- **ONE TOUR OUT** is an officer who completed one payback tour but was outside the DoD two tour window.
- **MULT TOUR OUT** is an officer who completed two or more payback tours, but the initial tour was outside the DoD window.
- **ONE TOUR IN** is an officer who has completed only one payback tour, and that tour was within the DoD window.

- **MULT TOUR IN** is an officer who completed two payback tours within the DOD window.

- **TOTAL COMPLY OPPORTUNITY** includes all officers completing some form of payback tour and those officers who have not used their subspecialty and are outside the DoD payback window. Officers in the MUST USE NEXT column do not count against this TOTAL COMPLY OPPORTUNITY since these officers still have a chance to utilize their subspecialty with a payback tour. These officers are more appropriately accounted for in the OVERALL TOTAL column.

- **OVERALL TOTAL** includes all officers that have received fully or partially funded graduate education.

- **PERCENT DoD COMPLIANCE** is the number of officers who have completed at least one payback tour inside the DoD window divided by the TOTAL COMPLY OPPORTUNITY number of officers for that subspecialty.

- **PERCENT OVERALL UTILIZATION** is the total number of officers who have completed a payback tour (regardless of whether the payback occurred in or out of the DoD window) divided by the TOTAL COMPLY OPPORTUNITY number of officers for that subspecialty. This statistic shows the overall percentage of officers receiving fully or partially funded graduate education who complete a payback tour regardless of whether the payback tour occurred in or out of the DoD window. Many times the need to assign officers to priority operational billets negates the ability to fully comply with DoD guidance for payback tours. BUPERS does, however, try to ensure maximum utilization of officers receiving fully or partially funded graduate education throughout their entire career. (CNP Memo 09 May 1994)

APPENDIX C. VARIABLE ELEMENTS FROM 94 OMF

FIELD	VARIABLE DESCRIPTION
DESIG	DESIGNATOR
WARSPEC	WARFARE SPECIALTY (URL, RL, STAFF CORPS)
PGUTIL	POSTGRADUATE EDUCATION UTILIZATION CODE
SSC1	SUBSPECIALTY CODE 1 (PRIMARY SUBSPECIALTY)
SSC2	SUBSPECIALTY CODE 2 (SECONDARY SUBSPECIALTY)
SSCLVL1	SUBSPECIALTY CODE LEVEL (P,Q,M,N) FOR PRIMARY SSC
SSCLVL2	SUBSPECIALTY CODE LEVEL (P,Q,M,N) FOR SECONDARY SSC
SEX	GENDER
PRD	PLANNED ROTATION DATE
PRDYR	PLANNED ROTATION DATE YEAR
PRDMO	PLANNED ROTATION DATE MONTH
PDS1A	PAST DUTY STATION 1 ARRIVAL DATE
PDS1AYR	PAST DUTY STATION 1 ARRIVAL YEAR
PDS1AMO	PAST DUTY STATION 1 ARRIVAL MONTH
PDS1D	PAST DUTY STATION 1 DEPARTURE DATE
PDS1DYR	PAST DUTY STATION 1 DEPARTURE YEAR
PDS1DMO	PAST DUTY STATION 1 DEPARTURE MONTH
PDS2A	PAST DUTY STATION 2 ARRIVAL DATE

FIELD	VARIABLE DESCRIPTION
PDS2AYR	PAST DUTY STATION 2 ARRIVAL YEAR
PDS2AMO	PAST DUTY STATION 2 ARRIVAL MONTH
PDS2D	PAST DUTY STATION 2 DEPARTURE DATE
PDS2DYR	PAST DUTY STATION 2 DEPARTURE YEAR
PDS2DMO	PAST DUTY STATION 2 DEPARTURE MONTH
PDS3A	PAST DUTY STATION 3 ARRIVAL DATE
PDS3AYR	PAST DUTY STATION 3 ARRIVAL YEAR
PDS3AMO	PAST DUTY STATION 3 ARRIVAL MONTH
PDS3D	PAST DUTY STATION 3 DEPARTURE DATE
PDS3DYR	PAST DUTY STATION 3 DEPARTURE YEAR
PDS3DMO	PAST DUTY STATION 3 DEPARTURE MONTH
PDS4A	PAST DUTY STATION 4 ARRIVAL DATE
PDS4AYR	PAST DUTY STATION 4 ARRIVAL YEAR
PDS4AMO	PAST DUTY STATION 4 ARRIVAL MONTH
PDS4D	PAST DUTY STATION 4 DEPARTURE DATE
PDS4DYR	PAST DUTY STATION 4 DEPARTURE YEAR
PDS4DMO	PAST DUTY STATION 4 DEPARTURE MONTH
PDS5A	PAST DUTY STATION 5 ARRIVAL DATE
PDS5AYR	PAST DUTY STATION 5 ARRIVAL YEAR

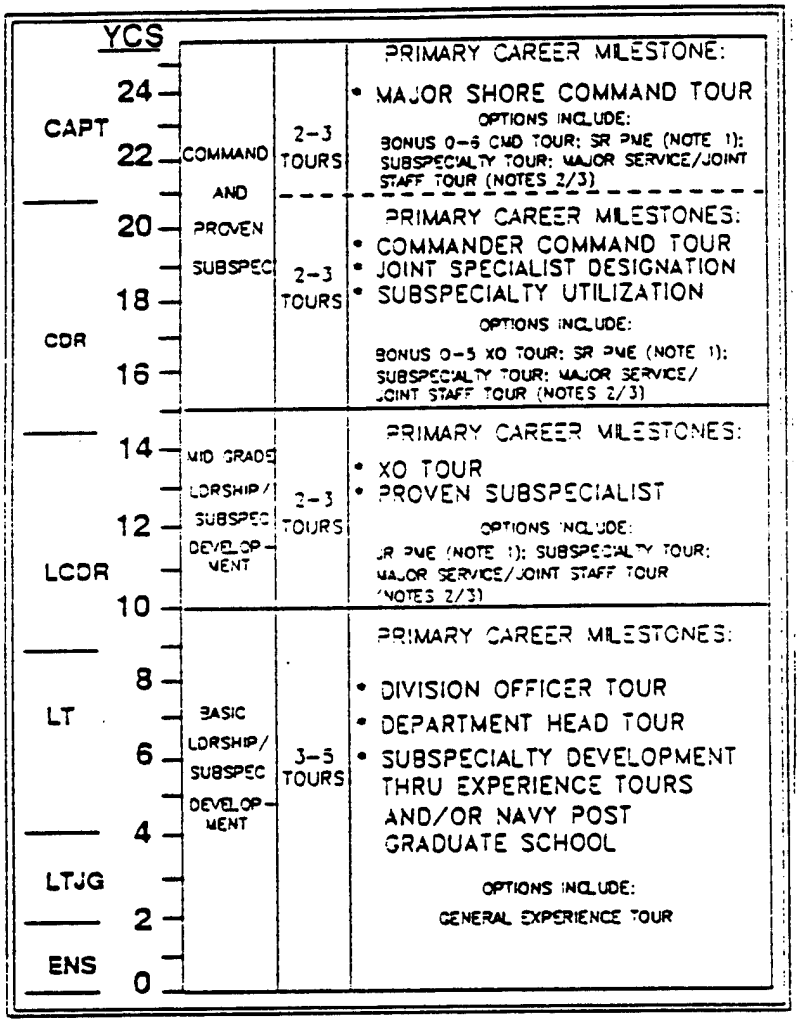
FIELD	VARIABLE DESCRIPTION
PDS5AMO	PAST DUTY STATION 5 ARRIVAL MONTH
PDS5D	PAST DUTY STATION 5 DEPARTURE DATE
PDS5DYR	PAST DUTY STATION 5 DEPARTURE YEAR
PDS5DMO	PAST DUTY STATION 5 DEPARTURE MONTH
PDS6A	PAST DUTY STATION 6 ARRIVAL DATE
PDS6AYR	PAST DUTY STATION 6 ARRIVAL YEAR
PDS6AMO	PAST DUTY STATION 6 ARRIVAL MONTH
PDS6D	PAST DUTY STATION 6 DEPARTURE DATE
PDS6YR	PAST DUTY STATION 6 DEPARTURE YEAR
PDS6MO	PAST DUTY STATION 6 DEPARTURE MONTH
SSUT1	SUBSPECIALTY UTILIZATION CODE AT PDS1
SSUT2	SUBSPECIALTY UTILIZATION CODE AT PDS2
SSUT3	SUBSPECIALTY UTILIZATION CODE AT PDS3
SSUT4	SUBSPECIALTY UTILIZATION CODE AT PDS4
SSUT5	SUBSPECIALTY UTILIZATION CODE AT PDS5
SSUT6	SUBSPECIALTY UTILIZATION CODE AT PDS6
RANKCURT	CURRENT RANK
DORCURT	DATE OF CURRENT RANK
LCDRDOR	LCDR DATE OF RANK

FIELD	VARIABLE DESCRIPTION
CDRDOR	CDR DATE OF RANK
CAPTDOR	CAPT DATE OF RANK

APPENDIX D. CAREER PLANNING MATRICES

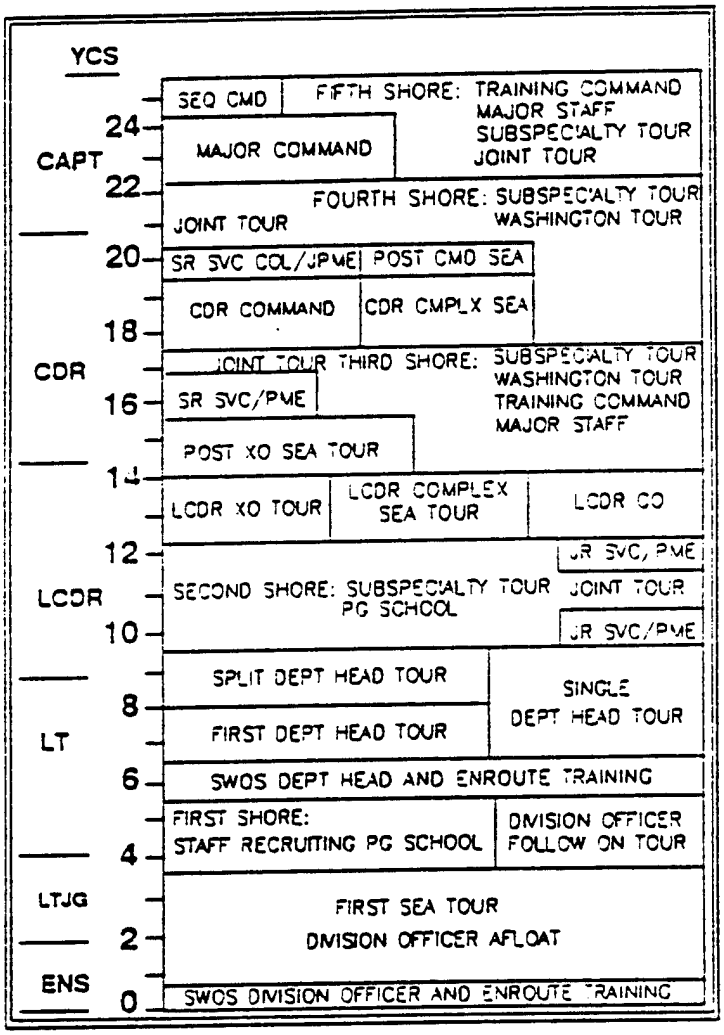
CAREER PROGRESSION PATHS OF URL OFFICERS

GENERAL UNRESTRICTED LINE OFFICER PROFESSIONAL DEVELOPMENT PATH

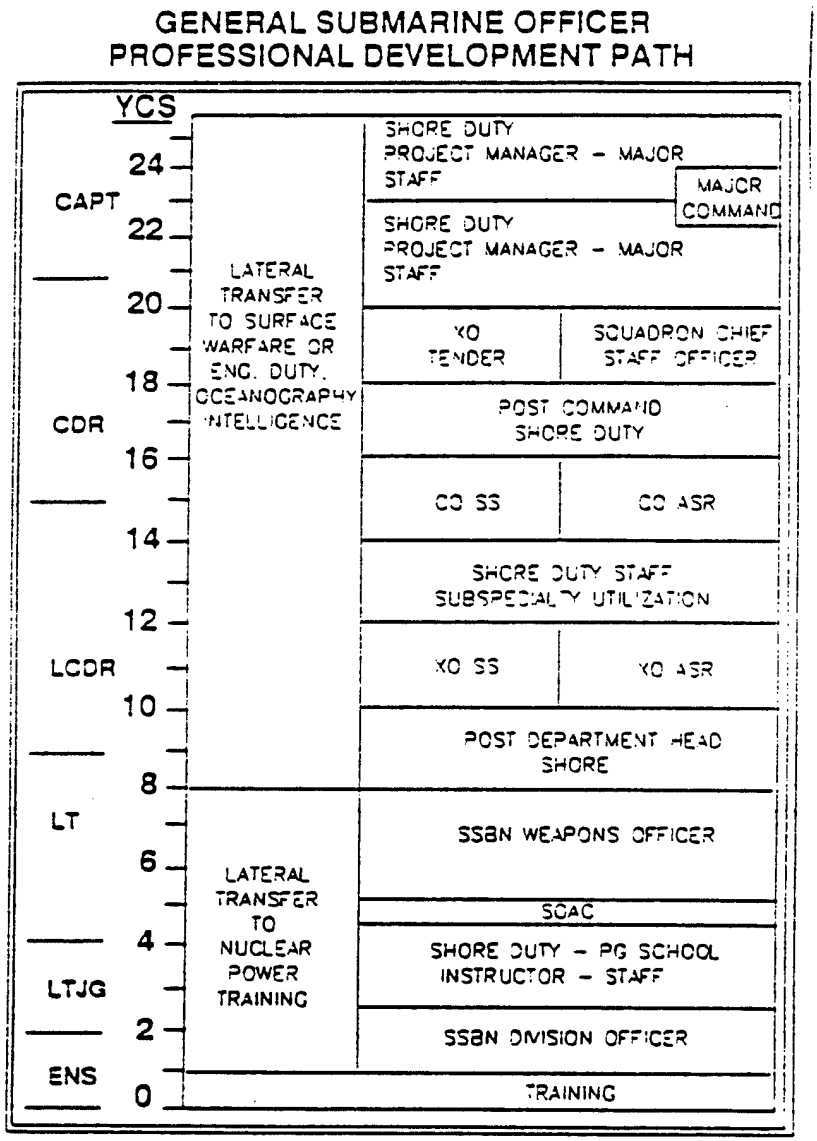


General Unrestricted Line Officer (1100) Career Progression Path

SURFACE WARFARE
PROFESSIONAL DEVELOPMENT PATH

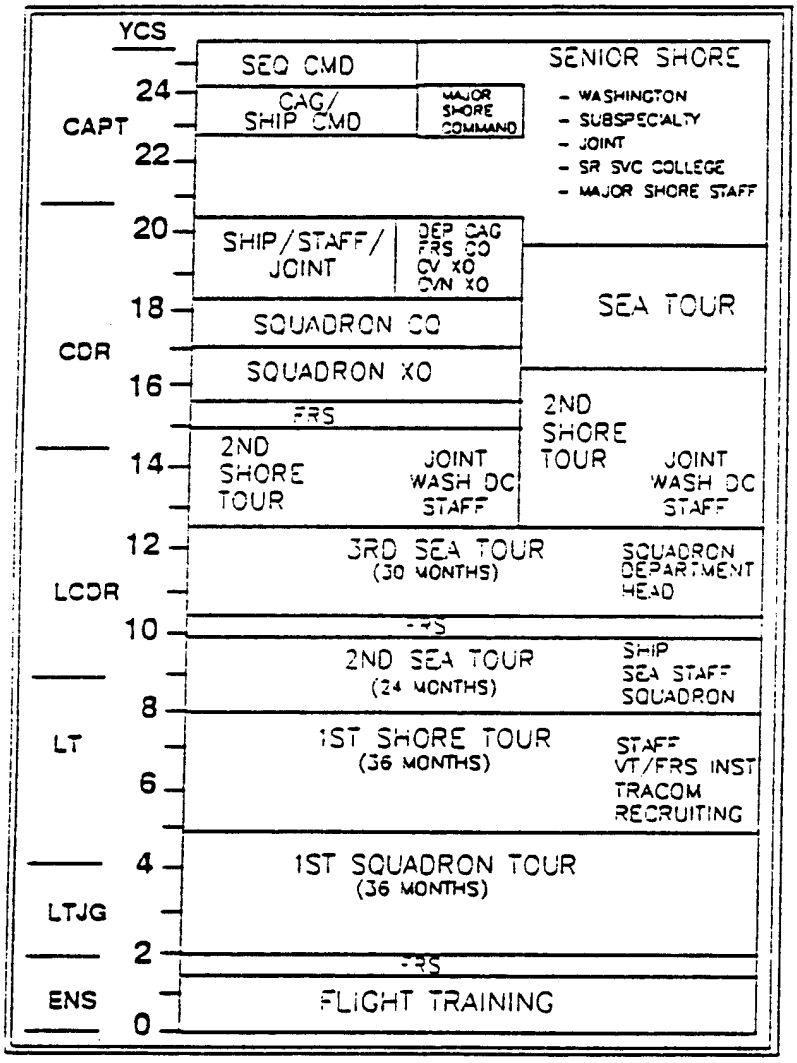


Surface Warfare Officer (1110) Career Progression Path



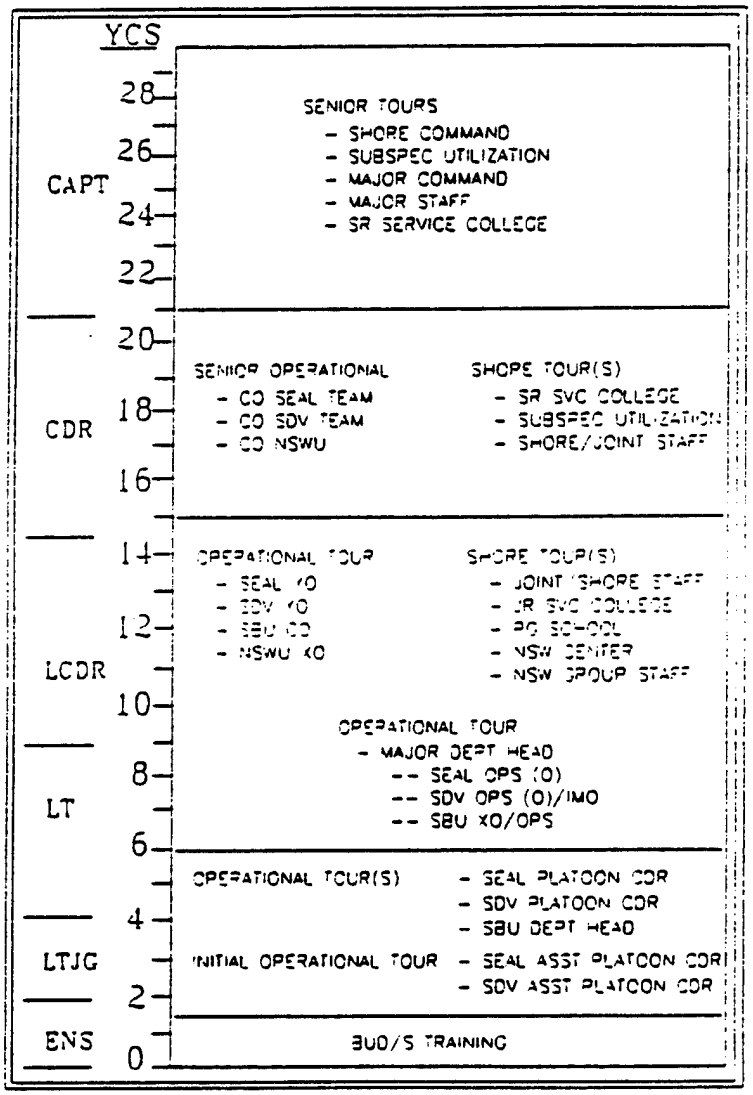
Submarine Warfare Officer (1120) Career Progression Path

AVIATION OFFICER (TYPICAL)
PROFESSIONAL DEVELOPMENT PATH



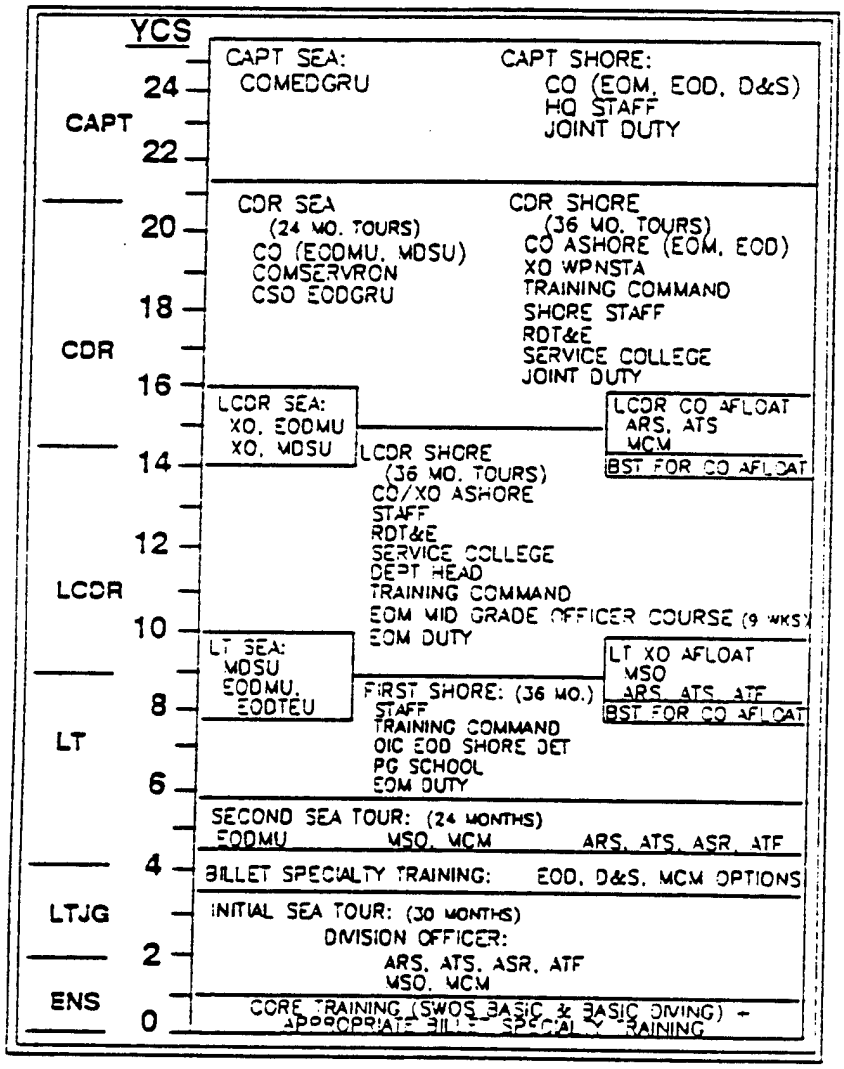
Pilot (1310) and Naval Flight Officer (1320) Career Progression Path

SPECIAL WARFARE OFFICER
PROFESSIONAL DEVELOPMENT PATH



Special Warfare Officer (1140) Career Progression Path

SPECIAL OPERATIONS
PROFESSIONAL DEVELOPMENT PATH



Special Operations Officer (1130) Career Progression Path

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